

**AXMX8
EMULEX PDP-11
MSCP DISK PREPARATION UTILITY
USER'S GUIDE**



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EMULEX PRODUCT WARRANTY

SOFTWARE WARRANTY: Emulex warrants for a period of ninety (90) days, either from the date of installation or thirty (30) days after shipment, which ever comes first, that each software package supplied shall be free from defects and shall operate according to Emulex specifications under those Digital Equipment Corporation ("DEC") operating system versions supported by Emulex. Emulex does not warrant its software products under any operating system which has not been specifically identified. Any software revisions required hereunder will cover supply of distribution media only and will not cover on-site installation of integration.

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1.1 Introduction

AXMX8 is an MSCP disk preparation utility designed for use with Emulex's VAX MSCP disk controllers and host adapters, as well as the Emulex Removable Disk Drive (EMR) Packaged Subsystem. The utility's basic function is to prepare a disk for use in a DEC operating system environment.

This utility is designed for use by qualified installers of Emulex equipment, and thus it assumes that you have some knowledge of hardware configurations, VAX/MicroVAX architecture and terminology, and interpretation of error messages and device register contents.

The document contains three main sections:

- Section 1** **General Description:** This section contains an overview of the AVMX8 disk utility, including its functions, hardware and software compatibility requirements, distribution media, and related documentation.
- Section 2** **Operation:** This section describes the functions of AVMX8, procedures for using AVMX8, and AVMX8 operations and options.
- Section 3** **Service:** This section explains Emulex service policies.

1.2 Product Overview

AVMX8 is an interactive, menu-driven utility. It allows you to perform the following basic operations to prepare the disk for use in a subsystem:

- Load/Edit NOVRAM (Emulex controllers only)
- Display current NOVRAM (Emulex controllers only)
- Format (Emulex controllers only)
- Format and Verify (Emulex controllers only)
- Verify
- Read only (media verification)
- List attached devices
- Replace a bad block

For details on these features, see Program Options, subsection 2.5.

One of the benefits of this program is that it limits user input requests to those appropriate to attached devices. Also, none of the program's operations that alter data either on the disk or in the NOVRAM are ever performed without your confirmation. Error printouts are as descriptive as possible. They contain the SCSI error status bytes or the MSCP error status (along with an English text description in some cases), and other status information appropriate to the attached devices.

This release of AXMX8 has been tested with and supports all Emulex MSCP disk controllers, as well as the UC04 and UC14 Host Adapters attached to Adaptec ACB4000 series, Iomega Alpha 10.5 device controllers, and Emulex MD21/S2 and MD23 disk controllers used in EMR.

1.3 Distribution Media

The following table lists and describes distribution media for AXMX8:

Kit Number	Emulex P/N	Description
PX9951801-01	PX9960305-00	.5-inch 9-track mag tape, 800 bpi (MT boot)
PX9951801-02	PX9960306-00	.5-inch 9-track mag tape, 1600 bpi (MT boot)
PX9951801-03	PX9960307-00	.5-inch 9-track mag tape, 1600 bpi (MS boot)
PX9951801-04	PX9960418-00	.25-inch cartridge, VAULT format (MS boot) for all Emulex products
PX9951801-05	PX9960514-00 PX9960515-00	8-inch floppy, RX02 format (DY boot) 8-inch floppy, RX02 format (DY-boot)
PX9951801-06	PX9960426-00	.25-inch cartridge, QT12 format (MS boot) for all Emulex products
PX9951802-01	PX9960413-00	IOMEGA disk cartridge, (DL boot)
PX9951802-02	PX9960419-00	.25-inch cartridge, VAULT format (MS boot) for packaged subsystems
PX9951802-03	PX9960420-00	IOMEGA disk cartridge, (DU boot)
PX9951802-04	PX9960427-00	.25-inch cartridge, QT12 format (MS boot) for packaged subsystems
PX9951805-00	PX9960724-00 PX9960732-00 PX9960725-00	5.25-inch floppy, RX50 format (DU-boot) for Disk and Tape, #1 5.25-inch floppy, RX50 format (DU-boot) for Disk and Tape, #2 5.25-inch floppy, RX50 format (DU-boot) for Communications, #3

1.4 Compatibility

This section describes the hardware and software requirements of AXMX8.

1.4.1 Hardware

AXMX8 runs on any DEC PDP-11 or LSI-11 system which has the following minimum hardware:

- 64K Words of Memory
- Console terminal
- Emulex MSCP disk controller or host adapter and compatible disk drive

- or -

Non-Emulex MSCP disk controller* for certain functions

*Emulex does not support or take responsibility for any operations performed on non-Emulex controllers.

NOTE

Emulex controllers or host adapters with firmware-resident diagnostics should use those diagnostics and not AXMX8. The firmware-resident diagnostic performs all AXMX8 functions. If you attempt to run AXMX8 when firmware-resident diagnostics are present, a screen message advises you of their presence and displays a limited menu.

1.4.2 Software

AXMX8 runs under the control of any version of XXDP. It does not require any additional software.

1.5 Related Documentation

The technical manual that accompanies your controller contains information you will need. Emulex controller and host adapter technical manuals (listed in the following table) are available from the address listed below.

TITLE	PUBLICATION NUMBER
UC04/M Intelligent Host Adapter Technical Manual	UC0451001-00
UC04/MO Intelligent Host Adapter Technical Manual	UC0451002-00
UC14/M Intelligent Host Adapter Technical Manual	UC1451001-00
UC14/MO Intelligent Host Adapter Technical Manual	UC1451002-00
MD21/S2 Intelligent Host Adapter Technical Manual	MD2151003-00
MD23 Intelligent Host Adapter Technical Manual	MD2351001-00
Emulex Removable Disk Drive Packaged Subsystem User's Manual	PE0950901-00
Emulex Removable Disk Drive (Embedded) Packaged Subsystem User's Manual	PE0950902-00
Sabre Packaged Subsystem User's Manual	PE0150901-00
QD01 Disk Controller Technical Manual	QD0151001-00
QD21 Disk Controller Technical Manual	QD2151001-00
QD32 Disk Controller Technical Manual	QD3251001-00
QD33 Disk Controller Technical Manual	QD3351001-00
UD33 Disk Controller Technical Manual	UD3351001-00
DM01 Disk Controller Technical Manual	DM0151001-00
DM02 Disk Controller Technical Manual	DM0251001-00
SC03/MS Disk Controller Technical Manual	SC0351001-00
SC41/MS Disk Controller Technical Manual	SC4151001-00

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Related Documentation

2.1 Overview

This section describes the functions of the AXMX8 formatter, procedures for using AXMX8, and its operations and options.

2.2 Program Description

This section briefly describes AXMX8 and its conventions.

2.2.1 AXMX8 Functions

The basic application of AXMX8 is in preparing MSCP disk drives for use in your system. Before a drive can be used, your CPU must recognize the Emulex controller or host adapter and the disk drive. Further, the disk must be formatted and any bad blocks identified. The operations AXMX8 performs during disk preparation are described in subsection 2.4.

AXMX8 provides options that allow you to initiate these functions. You use NOVRAM configuration options to set and review your drive parameters. Several format options are available for drive preparation. The procedures in subsection 2.3 explain the choices you have and which options you use. The options are described in subsection 2.5.

2.2.2 Supported Drives

This diagnostic supports drives which are compatible with MSCP disk controllers. For a list of drives supported by a particular MSCP disk controller, see the controller's manual. (Emulex MSCP disk controller manuals are listed in subsection 1.5, Related Documentation.)

2.2.3 AXMX8 Conventions

AXMX8 uses the following keyboard conventions:

<return>	required to terminate operator inputs
<Ctrl C>	at main menu--restarts AXMX8, displays all MSCP prompts for controller addresses, and prompts for vector
<Ctrl C>	in an operation--terminates the operation and returns to the main menu

2.3 Procedures

This section describes the procedures you can use to perform AXMX8 functions. Some procedures use options from the AXMX8 main menu. These options are described in subsection 2.5.

2.3.1 Load and Start AXMX8

AXMX8 runs under the control of the XXDP+ Diagnostic Supervisor. Before you can use AXMX8, you must start XXDP+. The procedure used to invoke XXDP+ and load programs varies from one PDP-11/LSI-11 system to another. Please refer to your system user's manual for information on bootstrapping and media loading.

Once XXDP+ is running, its prompt appears on the screen. Now you can load AXMX8. To do so, type:

.R AXMX8

AXMX8 identifies itself and displays the address and type of any MSCP controller it finds on the system. It also asks for a controller interrupt vector. If multiple controllers are found, the program displays the list of available controllers and prompts for the address of the controller to be tested. If an address not on the list is entered, the program rejects the input and reprompts for a correct address. The default for a single controller is the standard address of 772150; for multiple controllers the default is 760334.

Once a correct address is entered, AXMX8 is self-starting and displays the menu options. The menu appears as follows:

Program Option Menu

- 1 = Quit.**
- 2 = Format.**
- 3 = Format and Verify.**
- 4 = Verify.**
- 5 = Read Only Check.**
- 6 = List Known Units.**
- 7 = Replace block.**
- 8 = Edit / Load Novram.**
- 9 = Display Novram.**

Enter desired option number:

This menu shows all available AXMX8 options. Note that the Format, Format and Verify, Edit / Load NOVRAM, and Display NOVRAM options are available for Emulex controllers and host adapters only. Further, all menu and option features may not be available on all of the device types that AXMX8 supports. In these cases, AXMX8 either does not offer the option in the menu or the feature when the option is invoked, or displays a screen message when an unsupported operation is initiated.

2.3.2 Format & Verify Drive

The steps involved in disk preparation are formatting the drive and then verifying that each logical block is good. If any bad blocks are found during the format operation, you can replace them, so that the disk surface is ready to accept data. There are two ways you can do this: automatically and manually.

Automatic replacement, or blanket bad block replacement, is a feature of several AXMX8 options. With this feature, you can format a drive, verify, and replace any bad blocks in one step. During this format/verify operation, bad blocks are displayed in logical block number (LBN) format. If replacement is enabled, the blocks are replaced automatically.

Manual bad block replacement is a separate option (Option 7). This option allows you to identify specific bad blocks to be replaced. In addition, you can identify the blocks in Bytes From Index (BFI) format or in LBN format. Using BFI format eliminates the calculation required for LBN. This is most often useful in replacing blocks identified in the manufacturer's defect list.

BFI replacement must be done before any LBN replacement. Once LBN replacement occurs, the BFI values are no longer valid.

There are several ways you can use AXMX8 options to format and verify your disk. The method you choose depends on whether you:

- have formatted this disk
- want to replace blocks using BFI or LBN information
- want to preserve data on this disk

Each method is described below. The options listed are on the AXMX8 main menu. Use them in the order they are listed.

If this is the initial format of the disk and you want to replace only bad blocks found by the diagnostic patterns, use:

- Option 3, Format and Verify with replacement enabled

If this is the initial format of the disk and you want to replace manufacturer's detected defects only, use:

- Option 2, Format
- Option 7, Replace Block using BFI format
- Option 4, Verify with replacement enabled

If this disk is formatted and you want to preserve data and obtain a list of bad blocks, use:

- Option 5 with replacement disabled

2.3.3

Configure NOVRAM

The CPU knows about the controller and drives you add to your system because of information about them that you put into the NOVRAM. AXMX8 allows you to review and change this information. To review the current NOVRAM configuration, use Option 9. To change the values, use Option 8. The parameter values in decimal are in the Disk Drive Configuration Appendix of your controller or host adapter technical manual.

2.3.4

Abort Operation

To abort an operation in progress, use <Ctrl C>. AXMX8 then aborts the current operation, re-initializes the controller, and returns to the AXMX8 main menu.

A minimum delay of 10 seconds may occur between the <Ctrl C> and the next display. During some verify operations, the delay may be considerably longer because the abort is delayed until the successful completion of the current command. In this case, a screen message informs you of the delay.

2.3.5

Terminate AXMX8

To terminate AXMX8, use Option 1, Quit, on the main menu. To enter a new controller address and vector, enter <Ctrl C> at the main menu. AXMX8 then re-initializes the controller, displays the program header, lists the controllers available for test, and prompts for a new controller address and vector. If you enter a new address and vector, the AXMX8 main menu displays and you can select an option.

A minimum delay of 10 seconds may occur between the <Ctrl C> and the next display.

2.3.6

Restart AXMX8

You can restart the processor from location 200 if, for any reason, it is halted, as long as the computer has not been powered down.

2.4 AXMLX8 Operations

The two basic operations involved in disk preparation are formatting the disk and then verifying that each logical block is good. The verify operation uses data patterns you selected to run a user-selected number of read/write passes. AXMLX8 also provides options that allow bad block replacement.

This section provides a brief description of the operations used to analyze the disk surface.

2.4.1 Format Operation

The Format operation writes sector headers, initializes a drive's RCT tables, and destroys any existing bad block information. It is performed by the Emulex disk controller or host adapter.

2.4.2 Verify Operation

The verify operation uses the following series of operations (read, write, read, verify loop) to analyze and remove defective logical blocks from the disk. Verify operations are performed on 120 logical blocks at a time. Logical blocks are referenced by logical block number (LBN).

2.4.2.1 Read

The entire surface of the disk is first read to find any blocks with header or data ECC errors using the last data pattern written on the disk. This clears any errors which occurred during system operation. Errors may occur because of a grown defect or because of sensitivity to a data pattern not previously used. AXMLX8 displays the logical block number (LBN) of any blocks that cannot be read due to header or data field errors. If replacement is enabled, AXMLX8 replaces the block(s) in error.

This pass occurs only once at the start of the verify option.

2.4.2.2 Write

When the initial Read pass is completed, AVMX8 switches to Write mode. During the Write pass, the program writes the entire disk with a pattern from a list you entered. AVMX8 displays the LBN of any blocks that cannot be written due to header or data field errors. If replacement is enabled, AVMX8 replaces the block(s) in error.

2.4.2.3 Read

When the Write pass is finished, AVMX8 again Reads the entire disk using the last data pattern written. AVMX8 displays the LBN of any blocks that cannot be read due to header or data field errors. If replacement is enabled, AVMX8 replaces the block(s) in error.

2.4.2.4 Verify Loop

When each entire Write/Read pass is finished, AVMX8 checks to see if any blocks were replaced during that pass. If so, the program displays the number of blocks replaced and reruns the pass with the same data pattern. This ensures that replacement blocks are tested with the failing data pattern.

If no errors occurred, AVMX8 checks for another pattern to run. If all patterns have been run, it checks to see if the requested number of passes have been run. If not, the program starts the next Write/Read pass with the first data pattern in the list. When all passes are complete, AVMX8 displays the list of all blocks that were replaced during the Verify pass and waits for operator input.

2.5 AVMX8 Options

This section describes the function of each option on the AVMX8 main menu. The main menu and each submenu prompt for required input. When you enter a valid selection, the next menu displays or AVMX8 performs the selected option. If you make an invalid entry, AVMX8 rejects it, displays an error message, and reprompts.

In this section, operator responses to AVMX8 prompts appear in **bold** print. The symbol **<return>** indicates the carriage return key. The symbol **<Ctrl C>** indicates the Ctrl key and the letter C pressed at the same time.

Based on the nature of the MSCP emulation being performed, some operations may produce an observable delay when performed on previously unformatted drives. This delay is approximately 30 seconds.

When an option is finished, AVMX8 displays the prompt "Strike any key when ready" and waits for you to do so before returning to the main menu.

2.5.1**Option 1 - Quit**

The Quit option terminates the operation in progress and halts the CPU. If the computer is not powered down, AVMX8 may be restarted from location 200.

2.5.2**Option 2 - Format [Supported on Emulex Controllers ONLY]**

The Format option is used to initially format a drive. The operation writes sector headers, initializes the drive's RCT tables, and destroys any bad block information previously contained on the disk. It is used to format a virgin drive, a drive that has been determined to contain unusable data, or a drive with a format that is improper to use with a particular controller.

During the format operation for IOMEGA drives only, you are asked whether you want to disable ECC and the post-CRC check. Emulex recommends enabling both of these features. While this reduces the transfer speed, it increases data integrity. Interleave and dwell time settings are factory-set at the optimum value and cannot be changed.

After formatting, the drive contains a valid RCT with a serial number you specified.

Use this option if you plan to manually replace bad blocks identified on the manufacturer's defect list. See subsection 2.3.2 for more information.

2.5.3**Option 3 - Format and Verify [Supported on Emulex Controllers ONLY]**

This option formats a drive, then exercises the surface to replace defective sectors. It performs both of the operations that are available separately with options 2 (Format) and 4 (Verify). This option also offers a bad block replacement feature, which, when enabled, replaces any bad blocks found during the format operation.

Use this option if you do not plan to manually replace bad blocks identified in the manufacturer's defect list. See subsection 2.3.2 for more information.

2.5.4 Option 4 - Verify

The Verify option Write/Read exercises all user-available blocks. AVMX8 asks if the list of available patterns is to be displayed. If yes, the list of available patterns displays. If no, or after the list of patterns, AVMX8 prompts for the desired pattern.

Each data pattern is run until error-free for a single pass. When a block is encountered that cannot be accessed because of header or data field errors, the Logical Block Number in error displays. Because the failing pattern may not be the first pattern, it is possible that replacement blocks may not be tested with all patterns. For this reason, Emulex recommends running at least two Verify passes over all 16 data patterns.

The Verify option also offers a bad block replacement feature, which, when enabled, replaces any bad blocks by the technique appropriate to the attached controller.

Use this option if you plan to manually replace the bad blocks identified in the manufacturer's defect list. See subsection 2.3.2 for more information.

Example:

```
Enter logical unit number to run: 1
Pattern # 0 = 021516 021506 021570
.
.
.
Pattern # 15 = All 0's
Pattern # 16 = Run patterns 0 thru 15
```

Enter up to 16 patterns each separated by a space (default = 16):

Enter number of verify passes (default = 2):
Do you want to replace bad blocks found (default = Yes)?

Starting verify...

2.5.5**Option 5 - Read Only Check**

This option causes all the user-available blocks on the selected drive to be Read-only, not Write/Read, during the Verify pass. When a block is encountered that cannot be accessed because of header or data field errors, the Logical Block Number in error displays.

The Read Only Check option also offers a bad block replacement feature, which, when enabled, replaces any bad blocks by the technique appropriate to the attached controller. Because AVMX8 runs with ECC disabled and does not cache any read data, no corrected data is available to put in the replacement block. This means that even though the defective block is replaced and no forced error flag is set in the replacement sector, the data is non-valid.

CAUTION

This may cause problems if the replaced blocks contain executable program files. For this reason, you should back up sensitive data before running this option with the replacement feature enabled.

This option is usually used after the drive is formatted. However, if you plan to manually replace the bad blocks identified in the manufacturer's defect list, be certain to do so before using Option 5 with replace enabled. See subsection 2.3.2 for more information.

2.5.6**Option 6 - List Known Units**

This option causes the program to list all the drives that are configured in either the NOVRAM or controller configuration switches. Only those units that can be selected by the controller are listed as available.

A user size (in 512-byte blocks) and a media type I.D. are listed with all drives found by this option. The user size does not include RCT area, diagnostic cylinders, designated or hidden spare tracks or blocks, etc.

2.5.7

Option 7 - Replace Block

This option allows you to replace a specific bad block or group of blocks without using the blanket replacement feature found in the Verify and Read Only options. You choose to identify either logical blocks (entered in decimal MSCP Logical Block Number format) or Bytes From Index (as listed in the manufacturer's defect list), then enter a list of blocks to be replaced. This list can be reviewed and changed as needed. When it is complete, you initiate replacement and AVMX8 goes through the list and performs the replacement.

BFI replacement eliminates the calculation required to translate BFI to LBN format. AVMX8 requires the defect's cylinder, track, bytes from index, and length of error for each BFI entry. When you initiate replacement, AVMX8 prompts for the number of bytes per track (listed in the drive manual). As soon as you enter this value, AVMX8 begins replacing blocks.

LBN replacement allows you to replace blocks identified as bad during subsequent drive operations, when they are identified in LBN format by older versions of DEC operating systems which do not support host-initiated replacement.

If you are using both types of replacement, BFI replacement must be complete before LBN replacement is begun. Further, BFI replacement must be complete before the blanket bad block replacement feature of other options is enabled.

Emulex recommends that you run the Verify option after the replacement option is complete. This runs test patterns that may detect any pattern-sensitive blocks.

The Replace Block option is not supported for IOMEGA drives, floppy disk drives, drives equipped with ADAPTEC SCSI controllers, or the Emulex SABRE and MEDLEY subsystems.

2.5.8

Option 8 - Edit / Load NOVRAM [Supported on Emulex Controllers ONLY]

This option allows you to enter the drive configuration parameters into the controller. The current NOVRAM contents are used as default parameters. If the attached controller is a UCxx MSCP-emulating Host Adapter, AXMX8 first displays a series of SCSI device type codes to choose from. After you enter a type code, AXMX8 displays a menu appropriate to the chosen device type.

If the attached controller is a UCxx MSCP-emulating Host Adapter, AXMX8 asks for the SCSI address for each attached SCSI device controller and the logical unit number of each device attached to that SCSI controller. For information on SCSI addressing, refer to the host adapter and SCSI controller manuals. For information on device addressing, refer to the SCSI device controller manual.

AXMX8 automatically subtracts both the user-designated spares and the "hidden" spares that are based on controller type, so be sure to use the maximum allowable cylinders, heads, and sectors when prompted. For example, the MD21 Controller (used in EMR) always uses three cylinders as hidden spares.

NOVRAM parameter values are listed in your controller manual (see the drive configuration appendix that lists parameter values in decimal). Table 2-1 presents sample NOVRAM values. The values in the sample are those used for the QD21 with Maxtor drives.

Table 2-1. Sample NOVRAM Parameters

Maxtor 170	Maxtor 380	PDM 170	Description
1	1	1	Type Code
1*	1*	1*	Number of Units
34	34	35	Physical Sectors per Track
7	15	8	Physical Heads
1224	1224	1024	Physical Cylinders
1	1	1	Spare Sectors per Track
2	2	2	Spare Cylinders
0	0	0	Split Code
0	0	0	Removable Media Flag
3086	3086		Gap 0 Parameter
6682	6682		Gap 1 Parameter
3095	3095		Gap 2 Parameter
1	1	1	Sector Zero Offset

* The number of units will, of course, vary by individual application.

2.5.9

Option 9 - Display NOVRAM [Supported on Emulex Controllers ONLY]

This option displays the current contents of the NOVRAM. If the attached controller is a UCxx Host Adapter, AVMX8 first displays the list of SCSI device type codes.

3.1 Service

Emulex thoroughly tests its products. If AXMX8 indicates a malfunction with the Emulex hardware in your system, or if you have trouble with AXMX8 itself, contact Emulex or its representative.

In the continental United States, Alaska, and Hawaii contact:

Emulex Technical Support
3545 Harbor Boulevard
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(800) 854-7112 Outside California Only

Outside the United States, contact the distributor from whom the product was initially purchased.

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